

sporangium is small there are neither trabeculæ nor septa, the exigencies of nutrition, and perhaps also of mechanical strengthening, not being felt (*Lycopodium*): where the sporangium is large sterile bands of tissue are present; these appear as trabeculæ or incomplete septa in *Lepidodendron* or *Isoetes*, but as complete septa in the large synangia of *Tmesipteris*. To those who accept the homology of the synangium of *Tmesipteris* with the sporangium of other Lycopodiinæ the probability of this will appear specially strong. Such facts as these and their theoretical bearing are discussed at length in the memoir: the opinion is finally expressed that progressive sterilisation and formation of septa are factors which will have to be taken into account in solving the problems of origin of vascular plants, and especially of their numerous sporangia: such formation of septa will have to be considered as one factor which may help to explain the origin of the simpler vascular plants from forms of some Bryophytic character, in which the sporogenous tissue was one continuous band.

In the course of the investigation it has become apparent that *it is not possible to give any strict topographical definition of the arche-sporium which shall apply for all Vascular Cryptogams*. This will not surprise those who have recognised that the position of the arche-sporium is not fixed for all Bryophyta, while, on the other hand, the first segmentations which lead to the definition of the archesporium in Vascular Cryptogams do not correspond to those in Phanerogams, where there is a definite dermatogen.

The memoir, of which this is a brief abstract of a few of the salient points, is still incomplete: it is intended shortly to treat the spore-bearing members of the Filicinæ from a similar point of view, and in preparation for this a considerable number of observations have already been made. In the meanwhile, it may be stated that the main lines of argument pursued above in treating the strobiloid forms will be found to be applicable also for the Filicinæ. The second part will also include a general discussion of the whole subject.

XVI. "On *Megaladapis madagascariensis*, an Extinct Gigantic Lemuroid from Madagascar." By C. J. FORSYTH MAJOR, M.D., For. Cor. Zool. Soc. Lond., &c. Communicated by Dr. H. WOODWARD, F.R.S., V.P.G.S., &c. Received June 14, 1893.

(Abstract.)

The subject of the present paper is a somewhat imperfect Mammalian skull, together with a right and left mandibular ramus, apparently belonging to the same specimen, discovered by Mr. J. T. Last (collector for the Hon. Lionel Walter de Rothschild), in a

marsh at Ambolisatra, on the south-west coast of Madagascar, beneath a stratum of a white clayey substance (shell-marl ?) from 18 in. to 2 ft. in thickness.

At first sight the skull appears to have no relation whatever with any known Mammalian group, either existing or extinct.

Its salient features are :—The enormous lateral development of the anterior inter-orbital portion of the frontals, extending over the small thick-walled orbits; a comparatively narrow and elongate post-orbital frontal region, separated by a slight contraction from the equally narrow parietal region; a thick and flattened sagittal and an equally strongly-developed occipital crest. The zygomatic arch is high, and projects moderately outwards.

The brain-case is comparatively small in size, low and short, and placed at a considerably higher level than the facial portion. This last is elongate, with its anterior portion more elevated than the posterior. The cranio-facial angle is extremely obtuse, as in most of the lower Mammals, but, whilst in these the angle is open downwards, in the present skull it opens upwards, owing to the fact that both the facial and the cranial portions are somewhat bent upwards, the former anteriorly, the latter posteriorly.

A striking general character is the remarkable pachyostosis of all the bones of the skull.

The sutures are in great part obliterated, which, together with the advanced wear of the grinding teeth, is indicative of the old age of the specimen.

The cranium, in its general physiognomy, approaches, on the one hand to the South American "Howlers" (*Myctes*), on the other to some Marsupials, and particularly to the genus *Phascolarctos*.

These resemblances the author considers to be merely isomorphisms, and are not indicative of true parentage, which is to be sought amongst the Lemuroidea. Of this sub-order the present animal would form a much specialised and gigantic member, being approximately three times the size of the largest existing Lemurids.

In tracing out these affinities, the author relies in the first instance upon the conformation of the molars and premolars (the canines and incisors are not preserved), which approach closely to the grinding teeth of some Malagasy Lemurids of the genus *Lepidolemur*, and even still more to those of *Chirogaleus*.

It is further pointed out that, in its peculiar features, the skull itself only carries to an extreme, characters which are present, but in a much lesser degree and in varying gradations, in members of the Lemuroidea, both recent (Lemuridæ) and extinct (Adapidæ).

The diminutive size of the brain is viewed by the author, in this instance, as a degeneracy. He anticipates that crania of young specimens would present a striking approximation to existing

Lemurids, and probably most of all to *Chirogaleus*. These resemblances would consist in a more rounded cerebral cranium, in the brain-cavity being relatively much more voluminous, and possibly even absolutely so, than in aged specimens, and the facial portion more shortened. Especially it is to be expected that the post-orbital elongation of the frontals, an isolated feature in the Lemuroidea, will be absent in young specimens, as it is due solely to the development in the adult of aerial sinuses.

Passing to considerations of a more general nature, it is strongly to be insisted upon, as one of the results of this investigation, that the short cerebral and elongated facial portion of the cranium, universally accepted as a characteristic feature of the primitive Mammalian skull, are, on the contrary, indicative of a very specialised condition.

The author maintains that retrogressive evolution is more frequently to be met with amongst the Mammalia than has hitherto been admitted, "low" organisation being by no means always synonymous with "primitive" organisation.

In accordance with the conclusions arrived at, the author suggests the establishment of a new genus, *Megaladapis*, for the present fossil skull, as well as its collocation in a distinct family of the Lemuroidea.

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| Lemuroidea | { | 1. Adapidæ, <i>Adapis</i> (extinct). |
| | | 2. Anaptomorphidæ, <i>Anaptomorphus</i> , <i>Necrolemur</i> (extinct.) |
| | | 3. Lemuridæ (recent). |
| | | 4. Megaladapidæ, <i>Megaladapis</i> (extinct). |
| | | 5. Chiromyidæ (recent). |
| | | 6. Tarsiidæ (recent). |

As bearing upon the question of the geological age of *Megaladapis*, the author briefly reviews the contemporary Vertebrate fauna which has been brought to light by the explorations of Mr. Last, and the earlier researches of Grandidier, who (26 years ago) explored the same marsh at Ambolisatra. Some of the Mammalian remains obtained are too scanty to admit of accurate determination, but they are sufficient to indicate other not less strange members of this curious fauna. The following Vertebrata may be enumerated:—

MAMMALIA: *Megaladapis madagascariensis*, Major.

Hippopotamus Lemerlei, Grand.

Potamochærus, sp.

AVES: *Æpyornis maximus*, Is. Geoff. St. Hilaire.

„ *medius*, Milne-Edw. and Grand.

„ *modestus*, Milne-Edw. and Grand.

EMYDOSAURIA: *Crocodylus robustus*, Grand. and Vaillant.

CHELONIA: *Testudo Grandidieri*, Vaillant.

„ *abrupta*, Grandidier.

As to the geological age, the evidence obtained goes far to prove that this "sub-fossil" fauna existed at a comparatively very recent period, and that Man was contemporary with these Vertebrates. The evidence of various kinds may be arranged as follows:—

1. The very fresh aspect of all the remains, which are
2. Found in marshes and in recent alluvia (dunes), the formation of which is still in progress.
3. *Crocodylus robustus* is still existing in lakes in the interior.
4. Some of the bones bear traces of Man's handiwork.
5. The record of a monstrous animal, probably the *Hippopotamus*, is preserved in the legends of the natives.
6. Amongst the accounts—brief descriptions with native names—given by a trustworthy explorer of the seventeenth century, De Flacourt, are several which, on account of size and other characters assigned to them, cannot be identified with any animals actually existing in the island. One of the descriptions may possibly refer to *Megaladapis* and that of a bird, from the size of an Ostrich to one of the species of *Æpyornis*.

7. Remains of domestic cattle were found, together with the bones of the extinct forms of Mammals, &c.

On the other hand, evidence is adduced in support of the almost certainty that a *Tertiary* Vertebrate fauna will be, sooner or later, forthcoming in Madagascar, owing to the recent discovery of Tertiary lacustrine deposits in several different localities in that island.

XVII. "Some of the Effects and Chemical Changes of Sugar injected into a Vein." By VAUGHAN HARLEY, M.D., Teacher of Chemical Pathology, University College, London, Grocer Research Scholar. Communicated by GEORGE HARLEY, M.D., F.R.S. Received June 13, 1893.

(From the Physiological Institute, Leipzig.)

It being no longer doubted that sugar is essential to life, and it having been experimentally shown that the animal organism can form saccharine matter out of proteids, as well as carbohydrates, it becomes of importance to know what changes sugar undergoes in the body before its elements are finally eliminated.

According to present knowledge, it is considered that by the three chemical processes of hydration, oxidation, and reduction, the molecule of sugar is changed into larger and smaller molecular groups, and that it is in the breaking down and building up of these that heat and vital energy are developed. The basis of this belief rests on the observation that when sugar is artificially introduced into the